COLLEGE OF SCIENCE
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

AI for Ground Robots for Autonomous Coverage of Designated Areas

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Introduction

This project aims to enable ground robots autonomously cover a designated area. Ground robots are expected to generate an optimal path to cover a designated outdoor area without missing any parts, while avoiding people, pets, and obstacles in the area. Therefore, artificial intelligent approaches and algorithms for autonomous coverage of designated areas, and robotic obstacle avoidance methods are needed.
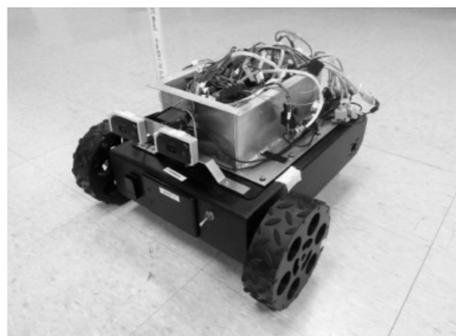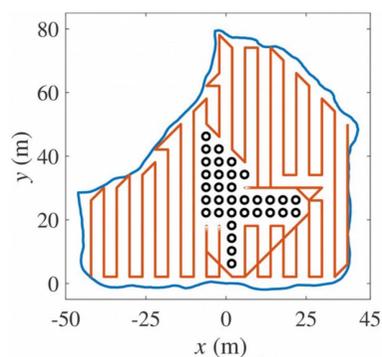

Fig.1 Experimental robot

Fig.2 Path of coverage

Results

Intelligent approaches and algorithms are designed for autonomous coverage of designated areas, and robotic obstacle avoidance methods. By using Matlab, the experimental robot is now able to recognize a designated area's boundary and the obstacles inside it. Aside from that, it will autonomously plan and successfully execute the motion of the robot for complete coverage, while avoiding obstacles.
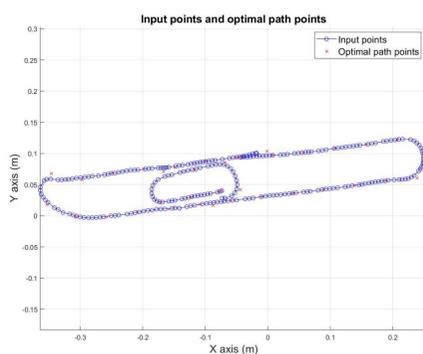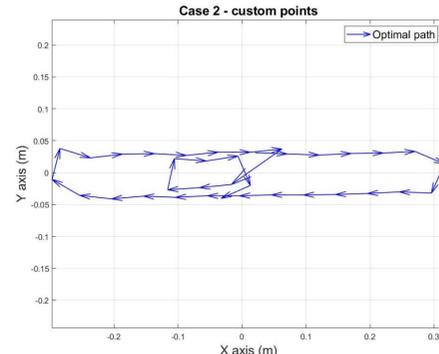

Fig.3 Real input points

Fig.4 Real optimal path

Impact

Since ground robots' popularity has been growing steadily, the applications of such an autonomous coverage capability for a ground robot are numerous. For example, it could be used for search and rescue operations, checking for chemical agents, mine sweeping, seed planting, crop fertilization, crop health monitoring, and harvesting.

Fig.5 Sweeping robot

Fig.6 Seeding robot

Explanation

Since ground robots are expected to generate optimal paths while avoiding obstacles, safe points and obstacle points need to be recognized at the beginning. Afterwards, optimal paths are generated by calculating shortest distance between points within a specific range by using algorithms designed earlier.
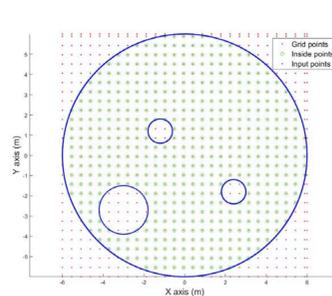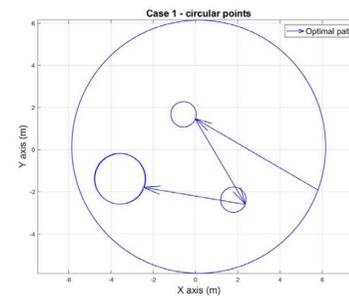

Fig.7 Circular points

Fig.8 Circular optimal path

Acknowledgements

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